

## T08D04 – 18.1 HL IB Practice

Name.....

1. The  $K_a$  value for an acid is  $1.0 \times 10^{-2}$ . What is the  $K_b$  value for its conjugate base?
- A.  $1.0 \times 10^{-2}$   
B.  $1.0 \times 10^{-6}$   
C.  $1.0 \times 10^{-10}$   
D.  $1.0 \times 10^{-12}$
2. What is the concentration of  $\text{OH}^-$  ions (in  $\text{mol dm}^{-3}$ ) in an aqueous solution in which  $[\text{H}^+] = 2.0 \times 10^{-3} \text{ mol dm}^{-3}$ ? ( $K_w = 1.0 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$ )
- A.  $2.0 \times 10^{-3}$   
B.  $4.0 \times 10^{-6}$   
C.  $5.0 \times 10^{-12}$   
D.  $2.0 \times 10^{-17}$
3. What is the relationship between  $K_a$  and  $\text{p}K_a$ ?
- A.  $\text{p}K_a = -\log K_a$   
B.  $\text{p}K_a = \frac{1.0 \times 10^{-14}}{K_a}$   
C.  $\text{p}K_a = \log K_a$   
D.  $\text{p}K_a = \frac{1.0}{K_a}$
4. The acid dissociation constant of a weak acid HA has a value of  $1.0 \times 10^{-5} \text{ mol dm}^{-3}$ . What is the pH of a  $0.10 \text{ mol dm}^{-3}$  aqueous solution of HA?
- A. 2  
B. 3  
C. 5  
D. 6
5. The hydrogen ion concentration in pure water varies with temperature. At a particular temperature  $[\text{H}^+] = 1.7 \times 10^{-7} \text{ mol dm}^{-3}$ .
- (a) State the expression for the ionic product constant of water,  $K_w$ , and calculate the value of  $K_w$  at this temperature.
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- (2)
- (b) Calculate the pH of water at this temperature.
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- (1)
- (c) State and explain whether water at this temperature is acidic, neutral or alkaline.
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(2)

(Total 5 marks)



6. Benzoic acid,  $\text{C}_6\text{H}_5\text{COOH}$ , is a weak acid.

- (a) Deduce the equation for the ionization of benzoic acid in water.

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(1)

- (b) Use information from Table 16 in the Data Booklet to calculate a value for the dissociation constant,  $K_a$ , for benzoic acid.

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(1)

- (c) Derive the ionization constant expression for benzoic acid and use it to determine the pH of a  $0.20 \text{ mol dm}^{-3}$  aqueous solution of benzoic acid.

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(3)

(Total 5 marks)

7. In aqueous solution at 298 K, ammonia is a weak base with a  $\text{p}K_b$  value of 4.75 and a  $K_b$  value of  $1.7 \times 10^{-5} \text{ mol dm}^{-3}$ .

- (a) Write an equation for the reaction of ammonia with water.

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(1)

- (b) State the ionization constant expression,  $K_b$ , for ammonia.

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(1)

- (c) Calculate the pH of a  $0.25 \text{ mol dm}^{-3}$  solution of ammonia.

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(3)

(Total 5 marks)